

# THE DENTAL PRACTITIONER

## AND DENTAL RECORD

*Including the official reports of the British Society of Periodontology, the British Society for the Study of Orthodontics, the European Orthodontic Society, the Liverpool and District Odontological Society, the North Staffordshire Society of Dental Surgeons, the Odonto-chirurgical Society of Scotland, and the Dental and Medical Society for the Study of Hypnosis*

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**Press Date:** 15th of preceding month. **Copy:** First week of preceding month.

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LEWIS, R. W. B. (1947), *The Jaws and Teeth*, 2nd ed., 471. London: Science Publishing Co.

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# THE DENTAL PRACTITIONER AND DENTAL RECORD

Vol. VII, No. 6

February, 1957



## EDITORIAL

### THE ALLIED SERVICES

THE vast field of health under the modern welfare state is served by an heterogeneous army of professional specialities and a variety of individual workers in their own particular spheres. Primarily the dental profession is responsible for the maintenance of the oral health of the community, but to ensure a high standard of oral hygiene in each individual member of the community is obviously beyond the powers of the dental profession. The profession can advise on these standards and is able to educate a section of the population, but to educate the whole community requires the active co-operation of the dental surgeon with the many specialized allied services, both paid and unpaid. The profession is of course represented on the various local and national committees, but it is particularly important that there is as much direct contact as possible between the practising dental surgeon and the individual social worker. Dentistry should not necessarily be confined to the dental surgery and professional activities may with profit extend outside the surgery. There are many problems in dentistry that will repay investigation by those who are interested. An interest outside the four walls of the dental surgery in the health problems that surround our daily lives will broaden our minds and increase our status. There are apparently

many other problems for the dental surgeon apart from those of human welfare. Despite our wide knowledge of dental anatomy and the teeth of animals in the sphere of natural science, active examples of practical research between the dental surgeon and the allied services who deal with the world of domestic animals appear to be few. Professor Hitchin's article on "Occlusion in Sheep" gives a glimpse into another realm of dentistry—indeed to many of us another world. It is hoped that this interesting article will stimulate ways and means of further co-operation into the many and varied problems that come within the orbit of dentistry through the work of the allied services.

#### **XII INTERNATIONAL DENTAL CONGRESS**

Dentists proposing to attend the Congress are advised to reserve accommodation as soon as possible as the best hotels are quickly booked up.

Those wishing to present films or clinical and technical demonstrations should send in their application to the Secretary General of the Congress, Dr. Pio Lalli, Via Boezio 16, Rome, not later than March 1, 1957. Application forms are obtainable from the National Treasurer of the International Dental Federation, or direct from Dr. P. Lalli.

## A STANDARD PROCEDURE FOR THE REMOVAL OF UNERUPTED WISDOM TEETH

By JOHN McCAGIE, F.R.C.S. (Edin.), F.D.S. R.C.S.

Assistant Director, Surgical Department, Royal Dental Hospital, London

DURING the last few years there has been a definite increase in the amount of surgical work undertaken by the general dental practitioner in his own surgery, and this must be catered for in the teaching of students. Much has been written on the removal of buried wisdom teeth, most of it tending to make the subject complicated and to suggest that a great deal of elaborate apparatus is necessary.

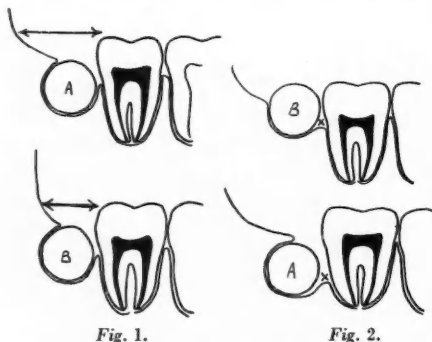


Fig. 1.—“Distal space”—showing that B is more difficult than A.

Fig. 2.—X shows depth of elevator, A being more difficult than B.

Head lamps, automatic water jets, and special tables undoubtedly contribute to the comfort of the operator, but not to the success of the operation.

A recently qualified practitioner will have none of these and an attempt is made here to evolve a standard procedure which can be taught to a student and which he can carry out himself with the simplest of facilities until his increasing experience allows him to modify it in accordance with fresh ideas.

Such a technique must be simple and it must be applicable to every case, it must require a minimum of apparatus and must be such that any dental surgeon without long experience can carry it out effectively with no more than one assistant.

### ASSESSMENT OF THE CASE

Many wisdom teeth are unsuitable for removal under local anaesthesia even by the experienced, and under N.H.S. conditions a lengthy operation is not an economic proposition. It follows therefore that an accurate method of assessing the difficulty of the case is essential.

A radiograph is of course vital, but the operator should not rely upon it too much. The taking and interpreting of dental radiographs is a skilled job and the practitioner should be able to obtain all the necessary information from quite a mediocre film. The man who has to buy and develop his own plates is not in the same position as the hospital X-ray department.

Assuming that the tooth cannot be removed by forceps in the usual way, it will eventually have to be elevated into the space between the ascending ramus and the distal surface of the second molar. This “distal space” is therefore of fundamental importance. In Fig. 1, B will always be more difficult than A.

The tooth will be elevated by placing an elevator below the mesial angle or in the bifurcation of the roots and the depth of these points is therefore an indication of how much bone will have to be removed to get the elevator into place. Again in Fig. 2, A will always be more difficult than B.

Further, the radiographs will show the configuration of the roots. If they are separate then the tooth can be split vertically and the two portions, each of root and crown, removed individually, while if they are fused then the tooth can be rotated as a whole.

When any tooth is elevated it will always move upwards, away from the elevator, and therefore (Fig. 3) the curvature of the roots may be favourable (A), unfavourable (B) or neither (C).

These three points, the extent of the "distal space", depth of the mesial angle, and the shape of the roots, do not require any elaborate radiography for their demonstration.

The size of the roots is a good guide, but the actual position of the tooth whether vertical,

at the chairside and get a perfect view of the operation field, brightly illuminated by an ordinary surgery light.

Most of the difficulties of oral surgery are caused by defective vision and access, and wrong positioning of the patient usually means

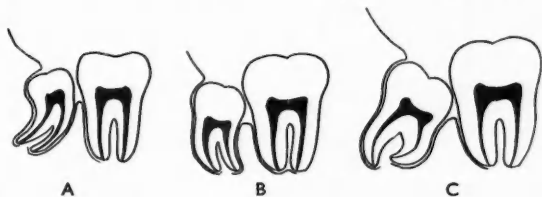


Fig. 3.—Curvature of roots. A, Favourable ; B, Unfavourable ; C, Neither.



A



B

Fig. 4.—A, Distal bone has to be removed although normal eruption relation of  $\bar{8}$ .  
B, No distal bone to be removed although the  $\bar{8}$  will never erupt.

horizontal or upside-down is not necessarily an indication of the difficulty. In Fig. 4, A will be much more difficult than B, although in A the teeth are in normal relationship to each other.

A case which requires much bone removal is not really a suitable chair case and should be admitted to a bed or referred to a hospital.

### OPERATION

**Preliminary.**—Before commencing the operation the patient should be so placed that both he and the operator are comfortable and are not required to maintain any unnatural position. Whether the patient sits or lies is a matter of personal preference, but it is quite easy to arrange that the operator shall stand

that the operator has to put his head in the light in order to see what is going on. Time spent at the beginning in adjusting the chair and light is never wasted.

Very few instruments should be needed and experience will always tend to reduce their number. A tray which rapidly fills with multi-shaped instruments is a sure sign that things are not going according to plan.

A knife, a periosteal elevator, a retractor and a trio of small elevators—left, right, and straight—form the basis, supplemented by a chisel, an osteotome, and a dental engine. It is an advantage to have all instruments with long handles, so that the operator's hands will be well outside the mouth and will not obscure the light.

An assistant to suck and retract is essential. Mechanical suckers are expensive, but the small water pump, sold for emptying washing machines, which fits on a surgery tap is quite adequate. A water jet is always a help, but a small hand syringe is just as effective.

**Exposure.**—It is a good principle never to attempt the removal of a root or tooth before fully exposing it and the adjacent bone. In the long run it saves time and an adequate incision is therefore the first step.

With all varieties of wisdom teeth the incision should be the same. From the distal edge of the 3rd molar forward in the midline to the distal edge of the 2nd molar and then with the blade hard up against the distobuccal angle downwards and forwards into the buccal sulcus. Such an incision will lie together afterwards and will not require suturing and it is capable of being extended in either direction. It will enable a broad based flap of mucoperiosteum to be raised, exposing all the buccal plate in relation to the last molar.

The mucoperiosteal flap should be reflected, cleanly off the bone, in one layer and it is useful to remember that it is easier to begin stripping from the anterior end of the incision than near the crown, where recurrent pericoronal infection will have produced much fibrosis.

Reflection of the flap must be continued back until the distal edge of the tooth or the bone overlying it can be clearly seen. Impaction on the bone distally is the commonest bar to the extraction of a 3rd molar and the removal of bone distally is much more difficult than buccally.

A probe will now show whether the mesial angle is accessible to an elevator.

**Movement.**—If the mesial angle is accessible a small elevator should be passed below it and gentle pressure—not force—applied in an attempt to move the tooth. The use of great force should have no place in this, or indeed any operation.

Sometimes this will cause the tooth to come right out, as impaction which is a bar to eruption is not necessarily a bar to elevation. In Fig. 4 (B) will elevate, but not erupt, while (A)

will not elevate without the removal of distal bone although it has erupted normally in relation to the other molars.

If, however, the mesial angle is not accessible then the bone must be removed until it is, bearing in mind that at this stage the bone is not being removed to extract the tooth, but in order to facilitate the insertion of the elevator.

There are three principal ways of removing alveolar bone, a hammer and chisel, a hand chisel or gouge such as a Couplands, and a bur in a dental engine. Each method has its advantages and disadvantages and each has its appropriate place.

A hammer and chisel is usually very unpleasant to the patient if used to any extent, and although there may be those hardy souls who would prefer a dozen good blows to five minutes of a more gentle method, any case which calls for much hammering is far better carried out under a general anæsthetic. The operator is committed to using both hands and cannot retract or support the jaw. It is not a method of much precision and it causes chips, each one of which must be carefully removed. The force of hammering is transmitted to bone, which is being left in situ and upon whose vitality the healing of the wound will depend. Its great advantage is that of speed, but that is not so important when working under a local anæsthetic.

A Couplands chisel can be used with one hand and allows of a little more accuracy. While it is ideal for removing roots in the thin bone of the maxilla it does not usually make much impression on the mandible, and access in the 3rd molar area is often very difficult.

A bur is the method of choice in most cases. It is well tolerated by the patient, it only requires one hand, and as it can be used with greater accuracy less bone will have to be removed. There are no chips, only a fine "bone dust" which can be removed by a water spray and sucker. If buccal bone has to be cut away to gain access, the whole thickness of the buccal plate has to be removed to reach the tooth, and it seems much more logical to drill round the periodontal sulcus with a bur when quite a small groove will give access.

Burs should never be allowed to run hot, as this will produce a necrotic area and therefore a spray of cold water is always needed. Burs clog up quickly and require to be changed frequently so that it is a great saving in time always to use the same size and shape, and a number 6 right-angle fissure bur will usually be adequate, with a similar bur on a straight hand piece for some inaccessible spots.

When the elevator has eventually been placed under the mesial angle and turned, the tooth may still not move, in which case it will be necessary to bur round the periodontal sulcus until it does, or in effect to enlarge its socket until it is loose.

**Disimpaction.**—When the tooth is mobilized, it will either come right out or else the true impaction will be seen and this may be quite different from that which appears on the radiograph. Impaction is always due to one or more of three things: impaction against the distal side of the 2nd molar, impaction against the bone distally, or impaction due to some formation to its own roots. The first is the commonest bar to eruption, but a combination of the 2nd and 3rd is the commonest bar to extraction.

Once the true impaction is evident the appropriate steps can be taken. The key to the success of the procedure lies in determining accurately what is stopping the tooth coming out and then removing the obstruction, rather than rushing blindly in with a big elevator and hoping for the best. If the tooth has been successfully disimpacted, very slight pressure with an elevator should be sufficient to deliver it.

Most impactions are due to the crown, and the crown is usually easy to remove with a bur or an osteotome. If the impaction is distal it is fairly simple to run round the distal border with a fissure bur until there is sufficient clearance for the crown to come up. If the roots are separate, and especially if they are the obstruction, it may be expedient to split the tooth vertically. When splitting a tooth vertically the blade of the osteotome should be placed in the groove between the two buccal cusps at an angle of  $45^\circ$  to the vertical access of the tooth. Even though the groove is not directly above the bifurcation the plane of

cleavage will generally go between the roots if the osteotome has been held at the correct angle. If, however, a bur cut has been made first and the osteotome placed in the cut, the resultant split will usually follow the line of the bur cut and this is an advantage when using an osteotome to remove a crown, as it may be difficult to get the instrument directly horizontal. In other words if it is desired to split the tooth horizontally a bur cut is advisable, but not if a vertical split is intended.

Generally speaking the harder the osteotome is hit the more likely is the split to go in the desired direction, and vertical or horizontal cleavage can generally be relied upon. Attempts, however, to split off individual cusps in the fashion of the "shaded areas", to be found in so many text-books, are usually doomed to failure. Sometimes the tooth will not split and the blow carries it out through the lingual plate. This is of no significance provided that no loose fragments are left. Indeed under general anaesthesia this is a very satisfactory method of removal, but under local anaesthesia it has its disadvantages, as it is difficult to control the size of the piece of lingual plate. For this reason if the tooth does not split after two blows it is wise to use some other method. It is always advisable to have the tooth freely mobile before splitting it, as any roots or fragments left will then be loose and easily removable. In radiographs the inferior dental canal is often seen in close proximity to the roots of the 3rd molar but this should be disregarded. Passage of the nerve between the roots is a very rare anomaly and provided that the operator does not go digging blindly in the depths of the socket there is no danger to the nerve. Some degree of mental anaesthesia does occasionally result from quite simple extractions, but provided the nerve is not actually severed the patient can be assured with complete certainty that full sensation will return. When working under a local anaesthetic it is rare that bleeding is of such an extent that it will interfere with the operation and it is best to ignore the bleeding and allow the assistant to deal with it with his sucker. Such bleeding will nearly always stop at the conclusion of the operation and therefore the

best way to deal with the bleeding is to get on with the job.

**Toilette of the Socket.**—This is in many ways the most important part of the operation, as it is upon the thoroughness of this, combined with the minimum of trauma, that the success of the operation depends.

After the tooth has been removed the socket must be thoroughly washed out and carefully searched for any loose fragments of bone, and any ragged edges smoothed off. If there has been much pericoronal infection there may be a mass of granulations behind the 2nd molar or much fibrous thickening of the flap and all this should be removed together with any loose tags of mucosa. If only a small portion of crown was erupted then there will be an excess of mucosa and this should be removed to leave a clean socket surrounded by healthy bleeding mucosa with no exposed bone.

If the incision has been correctly placed sutures are seldom needed and merely introduce infection. Sutures have to be removed and this painful process is often

dreaded by the patient more than the operation, and there is really no more reason for suturing a 3rd molar socket than for suturing a 1st or 2nd molar socket. Occasionally when the impaction is distal it is necessary to extend the incision backwards up the anterior border of the ramus and here the edges of the incision will not stay together by themselves. In this area bleeding may be more than in the buccal sulcus and for that reason a suture is often unavoidable.

Opinions vary as to whether the socket should be packed, washed out, or left alone and results show that it does not really make much difference. Local antibiotics have little effect, but if infection is to be feared a systemic course of penicillin or one of the newer oral antibiotics for three or four days post operatively will be of benefit.

As with any form of surgery, if the operation area is clean and free from infection to start with, and the operation is gentle and the resultant wound is kept clean, satisfactory healing will ensue.

## RELATIVE VALUES OF THE SUPPORTS IN PARTIAL DENTURE PROSTHESIS\*

By GEORGE A. SELLECK, D.D.S., San Francisco

WHERE do all of these mouths that need dental attention come from, and where and when did these dental problems have their beginning? These are some of the many questions I have often contemplated while examining hundreds of mouths and mounted study models in practice and in connexion with my work at the Dental School.

The dental problem is as old as civilization itself. However, we find abundant evidence of attempts to correct dental deformities in man's earliest written and unwritten records of human activity. A gold ring holding ox teeth, used as a bridge, is recovered from a Cornetian tomb of the fifth pre-Christian century, while at the same time the aboriginal races were

fashioning artificial teeth from the ivory of the elephant tusk. The first written laws of Rome which were promulgated 450 years B.C. and known as the law of Twelve Tables, forbade, for economic reasons, placing gold in a tomb with the body of a deceased, except that it was "not unlawful to bury or burn it (the body) with the gold with which the teeth may perchance be bound together".

Though to state that our profession is old, the problem is indeed older, and while we cannot solve it, we are obliged to contribute at least our share towards its solution. This paper is to present or discuss one phase of the many problems of dental restoration, or, more properly, dental replacements. Time and space do not permit for the moment a discussion of the multiple problems incidental to

\* A paper delivered to the American Dental Society of Europe on Monday, July 11, 1955.



diagnosis, procedure, and technique of fixed crown and bridgework. We shall therefore discuss the variable and varying types of replacements which are removable and which have for their support the remaining teeth, or the mucosa with its underlying osseous tissue, or both.

Practically all adults who present themselves for dental treatment have deformities of alignment which manifest themselves early in the individual's life, and which have received little or no orthodontic attention. The oral or occlusal deformities are too frequently aggravated by the loss of one or more teeth, and the consequent shifting and rotation of the remaining teeth, until the complete denture is without occlusal balance. We are told that the six-year molar is the keystone in the dental arch. This is not altogether true. Every permanent tooth is a keystone in the dental arch, and when a keystone is removed, the arch is destroyed. Except for the suggestion of suddenness, it would probably be better to compare the teeth with the links of a chain. The dental apparatus is only as strong as its weakest tooth.

If after the removal of teeth the remaining teeth would maintain their vertical relation, and would not drift and thereby impair occlusal balance, it would probably be better to avoid prosthetic restorations. We should realize that to do any constructive dentistry we have to do some destruction. In constructing a fixed bridge, using inlays or full veneers as abutments, it is necessary to cut away tooth substance. This is a mechanical, surgical procedure, and therefore a controlled operation. The teeth are entrusted to the skill of the operator. If they are cut too deep, or cut too rapidly without water or some other agent to dissipate the rapidly increasing temperature, injuries to the dental pulp occur, which too frequently do not repair themselves. The comparatively elementary operation of sealing a prepared tooth is in itself so simple that it is rarely given thought or consideration, and yet it is, and should be considered, a most important factor. A gutta-percha filling that leaks, or one that is poorly adapted, allows fermentation to take place and causes the teeth to become hypersensitive for long

and embarrassing periods of time. Is this then not an important factor?

Let us for the moment consider the construction of a cast clasp type of denture for the replacement of lost teeth, with its consequent grouping together of teeth of unlike function in one appliance, which uses a centipede type of design that takes in everything from the nasal spine to the tonsil, in order to replace two or three missing teeth. This dental appliance certainly takes its toll. The destructive effect of these contraptions reminds us that practically all adult patients who present themselves for dental prosthesis have occlusal deformities and that we, as dentists, do not prescribe proper treatment in too many cases.

Our objective in restorational dentistry to-day should be proper diagnosis and treatment. We, who are engaged in prosthodontia, can take a lesson from our colleague, the orthodontist. He makes study models and completes a diagnosis of every case, and, I might add, the models are beautifully made. I have conversed with mothers, returning with their children from the orthodontist, and have been amazed to learn how well informed the mothers are regarding the orthodontic problems of their children.

The patient who presents himself for prosthetic dentistry, however, is generally interested in two things: Will it hurt, and how much will it cost? There are many patients who are well educated in a new line of treatment and nomenclature. These have forced me to read all the trade journals to keep up to date. We can thank modern advertising for this, as it puts their product first, and we, as dentists, become their agents, and place our dental knowledge and skill second.

Probably one of the most impossible things in the practice of dentistry is to keep out of trouble. Dentistry, like other learned professions, from certain viewpoints must be regarded as a business, and business or commerce must in turn be regarded as mental in origin. Every important invention is first an idea. A dental motor is an idea conceived as a mental process and fabricated from metals and other substances, long known to man before the advent of the product. A porcelain furnace is

an idea worked out in platinum and refractory clays, and a prosthetic appliance or restoration is an idea assembled in gold, platinum, and teeth fabricated with or by the use of various other materials. If you once accept the view-point that in dentistry the idea, the invention, and the mental process are the important things, you can then readily see why any system of dentistry that takes away the necessity for original thought must become a failure. Without thought, the system is first, and technique precedes efficiency as well as dentistry. Too much technique and system tends to make an otherwise capable operator a robot.

Techniques have been developed which are as near perfect as can be had, but it must be remembered that dentistry is highly individualistic, and that it is very difficult to standardize humans. With well-made and mounted study casts a plan and a design can be made which will permit the operator to visualize an objective, and, when this is done, the technique becomes a vehicle to carry visualized plans to a satisfactory conclusion. It, therefore, makes little difference what or whose technique is used, if the basic fundamental principles of design and construction give the desired results. With these few introductory remarks let us now discuss a modern conception of dental prosthesis.

*Prosthesis.*—"Dental prosthesis is defined as the science and art of providing suitable substitutes for the coronal portions of teeth or for one or more lost natural teeth and their associate parts, in order that impaired function, the aesthetic appearance, comfort, and health of the patient may be restored." (Turner.) . . . The partial denture is a prosthetic appliance designed to be supported by two supports: the edentulous ridge area, and the remaining teeth. The supports are resilient and non-resilient. A partial denture may be unilateral or bilateral. A removable bridge is entirely tooth borne.

Experience has taught us that the use or period of usefulness of a given dental restoration is only too often dependent upon the reaction of the teeth or other tissues to the increased load carried in supporting the

appliance. Examine your cases after three, four, or five years of service, or as is frequently the case, when the patient returns to tell you that this or that has gone wrong. Has the appliance changed, has it disintegrated? The answer in nearly every case is "No". On the other hand, far too often we find that the tooth or teeth supporting the restoration have rebelled against the changed work or load factor, and are about ready to "give up the ghost". These changes are produced, to use the language of the bio-engineer, by stresses and strains to which the supporting tissues have been subjected. If we are to be successful in any true sense of the word, we must constantly study the problems involved in these stresses and strains, so as properly to distribute each, in order that the deleterious effects may be minimized or rather reduced to their least destructive possibility. In many instances stresses and strains can be decreased considerably by the intelligent use of one or more of the various stress-breakers. The types of supports selected are the most important factors for consideration in successful construction of removable bridges and partial dentures. The only supports are the remaining natural teeth and the mucosa to be used for the saddle. If the teeth are used as supports, they become abutments and act as retainers or stabilizers for removable bridges and partial dentures.

The attachments which are used to retain partial dentures or removable bridges are conveniently divided into two classes, depending upon the position of the attachment in relation to the tooth upon or from which it receives its support. The first kind is the internal type in which the attachment itself is placed within that which would normally be the substance of the tooth and is known as the precision attachment, while the second is the external type which rests or clasps the exterior of the tooth crown, of which the various kinds of clasps are examples. The internal or precision attachment has come to us more recently than the clasp, but is by no means new in dentistry. Parr exhibited and used such attachments over fifty years ago, and Morgan demonstrated another type of the same kind



of attachment over thirty years ago. Chayes has developed the modern precision attachment and McCollum has added the new distal extension.

Of the various types of clasps, three should be mentioned: the diagonal, the reciprocal, and the wrought wire. The diagonal type usually has its centre high on the approximal surface of the tooth to which it is attached, and in this position affords the opportunity of an occlusal stop or rest with little or no destruction of tooth substance. The arms of the clasp then proceed diagonally (from whence the clasp gets its name) across the height of contour and towards the gingival and the opposite approximal surface on both the lingual and buccal surfaces of the clasped tooth.

The reciprocal bearing, or roach clasp, is from a mechanical point of view more flexible than the rigid diagonal clasp. The reciprocal bars are constructed from the centre and have their bearing points on the tooth. They are objectionable in that they impinge upon or cross gingival tissue which too often exhibits embarrassing evidence of irritation, and, in addition, the reciprocal bars are themselves food retainers. The reciprocal bearing points are to the gingival of height of contour, and therefore in the area of the tooth which has the thinnest enamel. In most cases there is some recession about these teeth and the exposed dentine and cementum is, because of this, more than otherwise exposed and susceptible to caries.

The third type of clasp, the wrought wire with an occlusal rest properly adjusted, offers us the most in clasps. A comparatively large gauge of wire should be selected, but to proper length, and before bending and contouring should have both ends tapered on the lathe with a gold file so as to reduce the bulk at the ends where strength is not needed and to permit greater strength and bulk to remain on that part of the clasp (towards the centre) where it is subjected to the greatest tension. Inasmuch as wrought metal is more resilient than cast metals made from platinum alloys, and because it takes a lasting high polish, and it can be easily and well adjusted to the tooth, it is ideal from the standpoint of clasp cleanliness.

Partial dentures or removable bridges may be divided for the purpose of study into three general classes. They are:—

1. Tooth-bearing, or those which depend entirely upon the teeth for support.

2. Tissue-bearing, or those which rest upon the mucosa and are devoid of so-called attachments.

3. Tooth- and tissue-bearing, or those which use for their support both the remaining teeth and the mucosa.

**1. The Tooth-bearing Type.**—In order to be entirely tooth-bearing there must be remaining teeth at each end of the span, and these are used to support the removable bridge. The only arguments in favour of this type of bridge are that it can be removed and cleaned, and, therefore, it is cleaner than the fixed bridge, and it does not necessitate cutting into sound teeth with the consequent troubles which occasionally occur. This type of appliance is not nearly as satisfactory as fixed bridgework cemented into position, because it lacks stability, and if fitted too rigidly to non-resilient teeth, is responsible for injuries which are of greater consequence than those produced by judicious cutting of tooth substance.

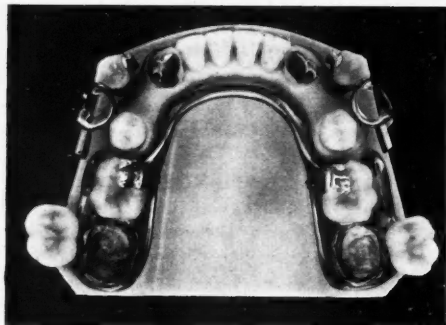
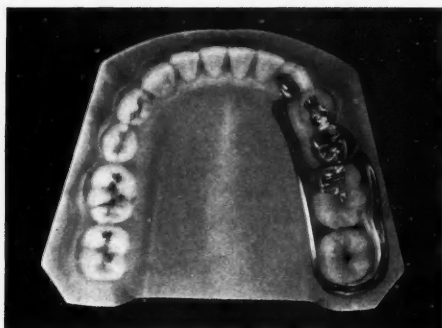
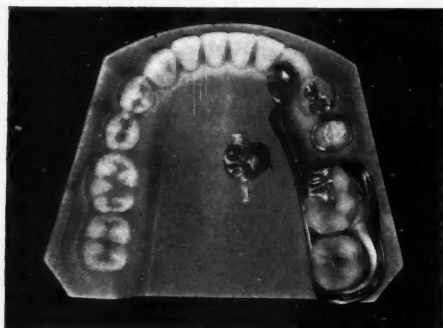
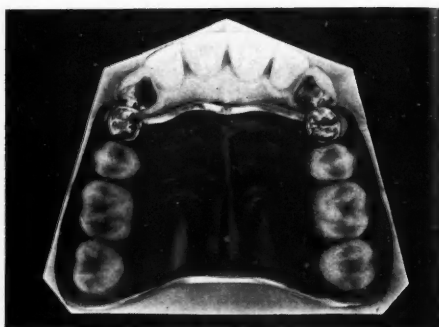
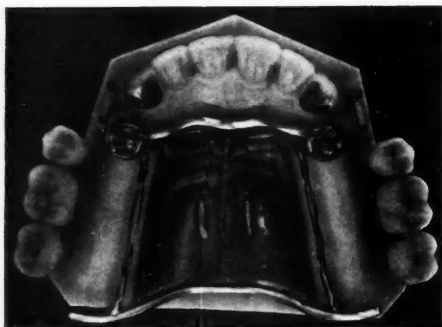
Most of the modern removable bridges of this type are made from hydrocolloidal gel impressions, by one-piece castings. The hydrocolloidal gel changes very rapidly if not properly cared for. The ratio of the agar-agar in the gel to the moisture is 1 part of solid to 99 parts of water. An experiment you may perform is to take a stick of one of the gels from its container and place it into a glass of water, cover all but 1 in. with water, and allow to remain over night. That part which was not covered with water will have shrunk to one-fourth the diameter of the stick. Reverse the experiment by placing the exposed end into the water over night, and it will regain its original size, but the stick at the end will have a fissure or crack, indicating that the material shrinks and swells, which is nearly certain to cause many inaccuracies.

The work of the United States Bureau of Standards on Refractories for Gold Inlays proved that it is quite difficult to obtain proper fits with larger inlay castings, unless the

operator is most exacting in his technique. It is my opinion that it is impossible to make a multiple casting of all metal in one mould without shrinkage. This shrinkage is, in my

purpose of this paper be considered as a denture rather than a removable bridge.

**3. The Tooth- and Tissue-bearing Type.**—These kinds of partial dentures, or removable



opinion, the cause of most of the failures in these types of removable bridge restorations.

**2. The Tissue-bearing Type.**—These have no clasps or other types of attachments, and because of the mechanics involved may for the

bridges, are by far the most satisfactory and the most universally used to replace missing teeth in those instances in which it is inadvisable or impossible to place satisfactory fixed bridgework. Too frequently, however, the

kind of attachments selected, or the position of their placement in relation to the remaining teeth, is responsible for the unnecessary and premature loss of valuable teeth. A popular but unsatisfactory design for this type of construction is to make a one-piece casting, sometimes using the full auxiliary stabilizer, which uses the lingual surface of the remaining teeth. This is commonly called the continuous lingual clasp. It is impossible, using this type of an appliance, to equalize the stress of mastication between the natural teeth and the denture. The resorption under the partial denture in time transfers the stress on the remaining natural teeth. This stress and strain produces trauma on these teeth and they are soon lost.

In removable bridge and partial denture prosthesis there has not been developed any type of attachment that can excel the precision types. This attachment permits a proper and controlled play or movement between the abutment and the appliance. The vertical parallelism also allows tissue resiliency. When occlusal pressure is made on the appliance, it is seated to the floor of the jacket, which is carried in the abutment tooth, where a halt is reached. When the appliance and tooth reach full occlusion, the abutments and ridge are carrying the load together. This type of construction permits a longer life to the supporting teeth, as it limits the stresses and strains.

The McCollum precision attachments with the dental extension stress-breaker offer the best means of stabilizing bilateral and unilateral partial dentures.

Clinical experience demonstrates that the precision attachment type of removable bridge and partial denture will give a longer service and a minimum amount of injury to either the resilient or non-resilient supports. Owing to the present economic condition this type of construction is limited and cannot answer the present-day denture problem.

A well-balanced, partial denture can be made with the rigid clasps and a stress-breaker that will give excellent service (*as shown in the illustrations*). The fundamental principles that will give this success are:—

1. Limit the one-piece casting;

2. Saddle to be independent from the abutment;

3. Unilateral and bilateral should always have stress-breakers between the abutment and the saddle;

4. A slight compression of the resilient mucosa saddle area, so that the appliance becomes tissue-bearing as well as tooth-bearing.

In conclusion, I would like to state that partial denture prostheses present by far a greater amount of variance than any other of the several branches of dentistry. Except for the objectionable one-piece method, diagnoses and techniques are as different and as many as there are dentists. This is true in sections of the country. What is the future of this removable bridge or partial denture problem? While I do not know what the answer to this question is, I feel that it will go in one of two directions. To the left we have the path of industrialization, and to the right the path of true service to the public and to our professional heritage. On the path of industrialization we find some who feel that dentistry can be turned out like automobiles, or kettles, or capsules—take a hydrocolloidal gel impression, and a wax bite, have the patient sign some kind of a note form, send the impression and bite to the laboratory, send the form to the discounting agency, and then play golf or read a periodical, to be interrupted only by the necessity of placing the appliance in the patient's mouth or to go through the same routine with another victim.

To take the road to the right is to give ourselves completely to our profession. No profession demands as much of its members as the profession of dentistry exacts of us, and no branch of dentistry exacts as much knowledge, skill, perseverance, dexterity, and probably self-sacrifice as that part which deals with the problem of partial dentures or removable bridgework, as it should be practised. Examine the whole situation, and if the path to the right is the correct road for us to take, do your part to preserve that which has been given us by those who have gone on and do your part to add to the sum total that we are obliged and happy to turn over to those who are to succeed us.

## THE MANDIBULAR CONDYLE\*

### FIFTY CASES DEMONSTRATING ARREST IN DEVELOPMENT

By D. GREER WALKER, M.B., B.Ch., M.D.S., F.D.S. R.C.S.

THERE are many well-known names connected with the development of the mandible. In the prenatal period Low (1909), Fawcett (1925), and Wilson Charles (1925) are but a few whose works are frequently quoted. In the later stages of development the name of Brash (1924) has occurred more frequently than any other. He was not only conversant with all the previous work but laid the foundations for much of the present-day research. Both Brash and Keith (1948) thought that special X-rays of the growing child might add considerably to the knowledge already attained. In this field the names of Broadbent (1931), Brodie (1941), Tweed (1946), and Margolis (1947) stand out as some of the early workers. This work has, however, met with some disappointments. The time old problem of "fixed points" has once again been apparent. Keith, speaking on this point during a discussion of Brash's work (1926), stated that everything was moving and nothing was fixed.

In this country Rix (1946), Ballard and Gwynne-Evans (1948), Hovell (1950), Walther (1954), and Tulley (1952) have turned their attention to what they prefer to call soft-tissue morphology. These workers feel that not enough attention has been given to the part played by soft tissue in facial development.

It is not my intention to discuss these works but rather to draw your attention to a study of some 50 cases demonstrating the importance of the condylar cartilage in the development of the mandible. In all these cases this centre of growth has been damaged in some way after birth. Heretofore there have not been many papers on this subject. I must mention Rushton (1944, 1948) who has constantly insisted on the importance of this centre of growth. Engel and Brodie (1947) reviewed 19 cases of condylar upsets in development. In this number they included some

congenital deformities. I do not propose in this paper to discuss the prenatal cases. Sarnat and Engel (1951) carried out some valuable experimental work on the Rhesus monkey, removing the condyle on one side. Their conclusions are parallel with mine.

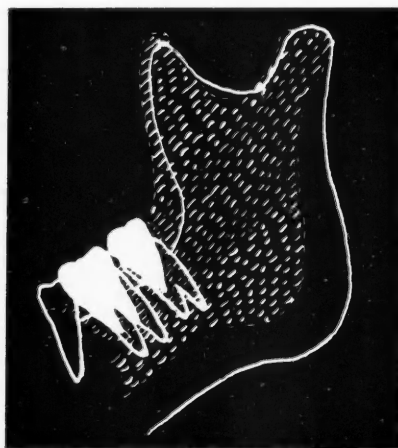


Fig. 1.—The under developed site is stippled and the teeth are white: this side is superimposed upon the opposite mandible which is unaffected.

In this series of 50 cases there were 39 with unilateral condylar interference and the remaining 11 cases demonstrated bilateral condylar arrests in development. I have subdivided the unilateral cases into three groups. The first, those resulting from middle-ear disease, the second from some form of trauma, and the third from some form of mandibular infection or the result of radiotherapy. Many writers have long recognized these causes as the responsible factors that can damage the condylar cartilage. A detailed analysis of the cases is given in Table I. Murphy (1914) writing on ankylosis of the temporomandibular joint listed four causes: middle-ear disease; mandibular osteitis; a metastatic arthritis; and trauma. He drew attention to the importance

\* Read at the meeting of the British Society for the Study of Orthodontics held at Newcastle upon Tyne on Friday, May 11, 1956.

of the condylar growth centre. Brophy (1916) reported Blair as finding that 50 per cent of his cases were of traumatic origin and he quotes Orlow's figures for trauma as 29.4 per cent. In my series I found that out of 39 cases of unilateral derangements 11 cases arose from middle-ear infection, 14 cases from osteomyelitis, etc., and the remaining 14 were the result of trauma. It must be remembered that nowadays there are likely to be less infective cases but unfortunately this may well be counteracted by the increase in those resulting from trauma. MacLennan (1952) writing on 180 cases of fractures of the condyle found that 2.78 per cent occurred in children under 10 years and 6.11 per cent under 15 years. These figures do not include crush injuries which have been mentioned by Dufourmontel (1929) and Rushton (1944). This is, I think, a very important factor. At any early age the condylar cartilage is very vulnerable and I am sure trauma to it accounts for more agenesis than we realize. I have formed the opinion that gross deformities can result from damage of the condylar cartilage up to the age of 6 years, thereafter the deformity is slight on the whole apart from the case that is basically a skeletal Class III. In this prognathic jaw at even a later date gross

deformities can occur. I have been unable to find any change in the size of the teeth or their eruption, except of course for the lack of molar room. In some of the severe arrests in development the third and second molars are placed in the ramus.

The cases arising from middle-ear disease suggest that the arrest in development has been a very gradual process. So also has been the limitation of gape resulting from the intra-articular infection. Two cases showed no limitation of gape at all but it is interesting to

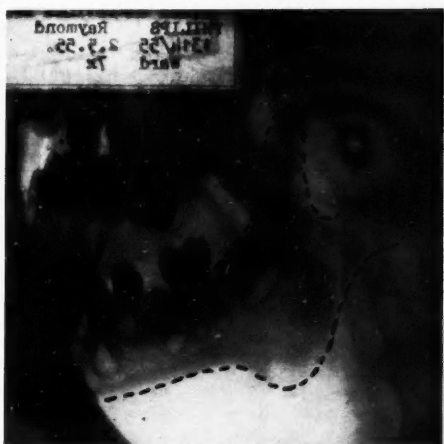


Fig. 2.—This patient was 8 years of age. At the age of 4 years, he was involved in a motor accident, and the left condylar growth centre has been damaged.



note that in both cases the history was vague. Both suffered from middle-ear disease and there was no history of trauma or osteomyelitis. The limitation of gape in the other 9 was variable; a condylectomy was performed for 6 cases, the remaining 3 though restricted had adequate movement. Perthes (1932) has commented upon the fact that if the jaw is ankylosed on one side it does not necessarily follow that the other joint will suffer damage. Professor Kilner has often stated that in cases of unilateral ankylosis the surgeon must be prepared at the same operation to proceed and remove the second condyle, in other words, treat the case as one of bilateral ankylosis. Two cases in this subsection required a bilateral condylectomy, that is the removal of the one condyle fixed as a result of the middle-ear disease, and the other joint secondarily involved possibly by the prolonged immobilization. It is interesting to note with regard to the latter that development has proceeded in spite of the secondary changes and this gives the answer in establishing whether the case is a unilateral or bilateral development arrest. Fig. 1 illustrates the typical case—it will be noted that the condylar centre is solely damaged and there is no interference to appositional bone growth.

The next group of condylar arrests resulting from trauma are similar in that only the condylar cartilage is involved (Fig. 2). In contrast, however, only 2 cases showed severe limitation of gape necessitating condylectomy. This can readily be explained by the different aetiology. Dufourmontel (1929), Perthes (1932), and Round (1933) are but a few who have reported fractures occurring in children. John Hallam (1956) tells me that he has seen approximately 2 cases under 5 years of age per year. Ronald Thexton (1956) has sent me the notes of a child who at the age of 4½ years sustained a bilateral fracture of the condyles. This is the youngest child I have seen with this fracture. Dufourmontel thought that the condyle in the young child being short and more straight was less liable to fracture and therefore more easily crushed. Rushton (1944) has pointed out the extreme soft nature of the growing centre and the ease with which a "crush injury" can occur. It would seem that after the age of 5 years the condyle will in all probability fracture at the neck. Before this age the damage will be more in the nature of a "crush injury". In a previous paper (1942) I was under the impression that ankylosis following trauma was possibly assisted by infection. This I now believe to be incorrect

Table I.—ANALYSIS OF 50 CASES

1. Unilateral condylar derangements	39 cases	
a. Arising from middle ear infection		11 cases
b. Arising from osteomyelitis, etc.		14 cases
c. Arising from trauma		14 cases
2. Bilateral condylar derangements	11 cases	
a. With ankylosis		8 cases
b. Without ankylosis		3 cases

## Analysis of 11 Cases of Unilateral Middle Ear Infections

Name	Age at Time of Infection	Mastoid Infected	Limitation of Gape	Degree of Deformity at Age
J. E.	6 yr.	L.	Severe	Slight 23 yr.
M. R.	15 mth.	L.	Severe	Marked 9 yr.
S. R.	11 yr.	L.	Severe	None 19 yr.
J. T.	?	L.	None	Marked 22 yr.
R. C.	7 yr.	L.	Severe	None 12 yr.
N. W.	1½ yr.	R.	Severe	Marked 9 yr.
V. M.	3 yr.	R.	Severe	Marked 24 yr.
P. L.	5 yr.	L.	Severe	Slight 24 yr.
P. P.	?	L.	None	Slight 14 yr.
V. P.	3 yr.	R.	Very severe	Marked 22 yr.
K. McK.	4 yr.	R.	Very severe	Marked 23 yr.

*Analysis of 14 Cases of Unilateral Mandibular Infections, etc.*

Name	Age and Nature of Infection	Side Affected	Limitation of Gape	Degree of Deformity at Age
M. D.	18 months extensive infection R. side of face	R.	Severe	Marked 22 yr.
R. M.	6 wk. osteomyelitis of mandible	R.	None	Marked 15 yr.
P. S.	4 yr. osteomyelitis of mandible	R.	None	Marked 13 yr.
G. B.	3 yr. osteomyelitis of mandible	R.	None	Marked 9 yr.
L. E.	2 yr. osteomyelitis of mandible	L.	Severe	Marked 5 yr.
E. C.	2 wk. septicæmia	R.	Severe	Marked 11 yr.
R. P.	2 yr. osteomyelitis of mandible	L.	Severe	Marked 19 yr.
L. M.	5 yr. osteomyelitis of mandible	L.	Severe	Marked 19 yr.
T. T.	2 yr. osteomyelitis of mandible	L.	None	Marked 7 yr.
L. M.	2 yr. osteomyelitis of mandible	L.	None	Marked 26 yr.
M. D.	12 yr. osteomyelitis of mandible	R.	Severe	None 24 yr.
E. B.	4 yr. radiotherapy	R.	None	Marked 15 yr.
L. W.	6 mth. radiotherapy	R.	None	Slight 12 yr.
P. S.	7 yr. septicæmia	R.	Severe	Marked 34 yr.

*Analysis of 14 Unilateral Traumatic Cases*

Name	Age and Nature of Trauma	Side Affected	Treatment	When First Seen or Period of Follow-up	Degree of Deformity	Limitation of Gape
J. O.	5 yr.: fracture condyle	L.	Intermax. fixation	Immediately. Follow-up 1½ yr.	Slight	None
R. P.	4 yr.: road accident	L.	None	First seen age 8 yr.	Marked	None
C. E.	6 yr.: fracture condyle	R.	Intermax. fixation	Immediately. Follow-up 8 yr.	Slight	None
J. P.	4 yr.: blow on jaw	R.	None	First seen 3 yr.	Marked	None
L. W.	8 yr.: fell downstairs	R.	None	First seen 18 yr.	Marked	Severe
M. W.	2½ yr.: fell downstairs	L.	None	First seen 20 yr.	Marked	None
W. R.	4 yr.: fell from bed	R.	None	First seen 30 yr.	Marked	None
A. B.	? age: road accident	R.	None	First seen 31 yr.	Marked	None
B. M.	8 yr.: kick on jaw	L.	None	First seen 14 yr.	Marked	None
D. C.	6 yr.: road accident	R.	None	First seen 9 yr.	Marked	None
A. H.	6 mth.: deformity noticed	L.	None	First seen 6 yr.	Marked	Severe
E. R.	5 yr.: fracture condyle	R.	Intermax. fixation	Immediately. Follow-up 3 yr.	None	None
A. M.	5 yr.: fracture condyle	R.	Intermax. fixation	Immediately. Follow-up 1½ yr.	Slight	None
J. C.	Unknown. (No history of infection)	R.	None	First seen age 9 yr.	Marked	None

*Analysis of 11 Cases of Bilateral Condylar Under-development*

Name	Age and Cause	When First Seen or Period of Follow-up	Degree of Deformity	Limitation of Gape
P. D.	3 yr.: fell 10 ft.	First seen age 7 yr.	L. more marked than R.	Almost complete
P. C.	Unknown	First seen age 15 yr.	L. more marked than R.	Almost complete
C. B.	Unknown	First seen age 22 yr.	L. more marked than R.	Very severe
W. P.	3 yr.: fell downstairs	First seen age 32 yr.	L. more marked than R.	Almost complete
A. M.	6 yr.: fell from window	First seen age 11 yr.	R. more marked than L.	Marked
L. L.	Unknown	First seen age 14 yr.	L. more marked than R.	Almost complete
H. A.	Unknown	First seen age 42 yr.	L. more marked than R.	Almost complete
P. P.	14 yr.: kicked on jaw	First seen age 23 yr.	R. more marked than L.	Almost complete
J. H.	10 yr.: R. fracture of condyles	Immediately: interdental fixation. Follow-up 11 yr.	Both sides appear to be equally involved	No limitation
M. S.	Unknown	First seen 30 yr.		
J. D.	Unknown	First seen 25 yr.		

and I think one of two processes may happen which causes the fixation. The first is that the glenoid fossa may become fused with the union of the bony fragments. This would of course be only possible in the case of a fracture dislocation. The second is that the condylar growth may be partially arrested, this is to say, that the central portion of the cartilage sustains the main damage whilst the periphery

congenital cases which I hope to discuss in a later paper. The large proportion of this section results from some form of mandibular infection in the young child. I cannot help repeating my view (1947) expressed some years ago that great care ought to be exercised in treating these infections in the early stages. Many of the cases originated from a simple dental abscess. The main cause for the

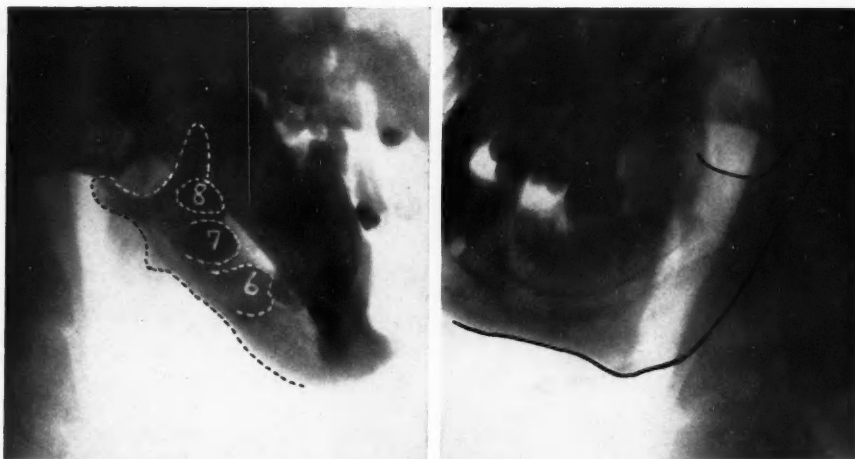


Fig. 3.—The patient was 15 years of age. He sustained a severe infection of his right mandible at the age of 6 weeks. If it is compared with the opposite site it is quite obvious that little or no growth has taken place.

escapes. This could well account for the "mushroom" appearance of the condyle so commonly seen in these cases. This distorted growth could produce a mechanical limitation in the early stages and later lead to a complete bony fusion. In some cases the limitation is early in its onset and might well be due to the former whilst other cases pass a considerable time with gradual increasing limitation accounted for by the latter explanation.

The last of the unilateral cases—those arising from osteomyelitis or the result of radiotherapy—are different from the two former sections in that the extent of the maldevelopment can be so variable. The most severe suggest the "frozen ramus" where it would appear that all appositional bone growth is also destroyed (Fig. 3). This case must be carefully distinguished from the

arrested development was some form of osteomyelitis: 2 cases resulted from septicæmia and 2 were the result of radiotherapy. The latter can of course produce a much more extensive arrest in development, not only condylar, but all the bones in the area. The effects of radiotherapy on developing bone are well known and need no further mention, but there is one particular aspect that might be worthy of further consideration. It is that certain developing centres are more active at certain times than others and further that a maximum development of a bone occurs at a certain stage. One wonders whether it would not be wise—in cases where delay is possible—to postpone this form of treatment until the maximum growth stage is passed. I have, for example, said in this series that all the gross deformities with one



exception originated from condylar damage before the age of 6 years.

Turning to the bilateral cases, I have only included those cases which have definitely a primary bilateral condylar arrest in development. I have pointed out previously that



Fig. 4.—The postero-anterior view of the mandible shows the atrophic changes in the condylar region.

in the unilateral cases there may be secondary fixation in the other joint. There is no apparent upset in development following this secondary fixation. The bilateral cases can very quickly develop a limitation of gape and require condylectomy at an early date. There were only 5 cases with a definite history of trauma; in the remainder it was impossible to elicit the cause. I think that the most likely cause is some injury sustained early in life and this has passed unnoticed. This injury may cause some distorted growth as previously mentioned, the limitation of gape occurring early or at a later date. It will be noticed on studying these cases that there may be a difference between the right and left sides suggesting that the degree of damage to the growing centre can vary. The characteristic of this group is the absence of chin. All this group showed limitation of gape except 3; in these

there was perfectly free movement. These 3 cases tended to show atrophic changes in the condylar region as opposed to the other cases which demonstrated more productive changes (Fig. 4). In a previous paper (1942) I referred to hyperæmic decalcification following a fracture dislocation and it may be that these cases can be visualized as arising in such a manner. I feel, however, that some more work is needed on this question.

Professor Lucas is in the course of preparing a paper on the study of many of the condyles included in this paper. His observations will I understand be shortly published.

### CONCLUSIONS

**1. The Primary Deformity.**—There is no doubt that the observations of Brash, Rushton, Brodie, and others are correct. *The condylar cartilage is the major factor in mandibular development.*

If this centre is destroyed then all downward and forward growth ceases. If we superimpose the X rays of the arrested side upon the growing side the answer is the same in all cases. I have assumed in these post-natal cases that there is no difference in the position of the glenoid fossæ. The glenoid fossa has therefore been taken as a moderately fixed point and Fig. 1 demonstrates the result. I have already mentioned that the worst deformities occur early in life and little or no change occurs after 6 years of age except in the skeletal Class III cases.

**2. The Secondary Changes in the Mandible.**—It has been pointed out on many occasions that the growing side will cross the midline to compensate for the partial arrest in development. This accounts for the typical clinical pictures so often described with the flattening occurring on the normal side (Fig. 5). *There is therefore, a change in the so-called "basal bone" brought about by failure in condylar development.*

**3. The Secondary Changes in the Alveolar Bone.**—It is natural to suppose, and in fact what happens is, that *the alveolar bone follows the deformity of the basal bone of the mandible.* It is perhaps less obvious to know exactly why the maxillary alveolus should follow suit also

and manifest in the severe cases a marked maxillary alveolar deformity. In all cases the molar teeth are in some form of occlusion; the anterior maxillary teeth, however, may project anterior to their opposite number in the mandible. Whilst the deformity can play

a large part it must be remembered that this condylar arrest is superimposed upon a variety of skeletal genetic types. In examining these cases this must of course be carefully borne in mind. There is a great adaptability—for want of a better term—as far as occlusion is

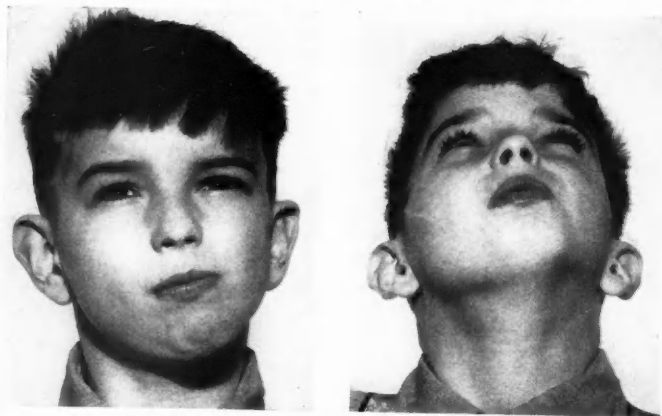


Fig. 5.—The condylar arrest of growth on the left side demonstrates the typical deviation of the chin.

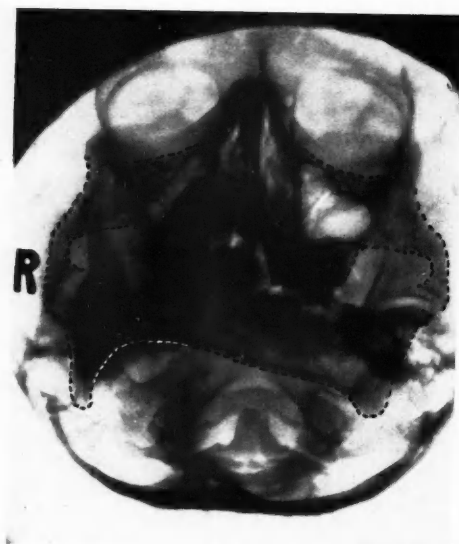


Fig. 6.—The occipito-mental radiograph shows the changes in the maxilla secondary to a primary lesion of the right condylar growth centre.

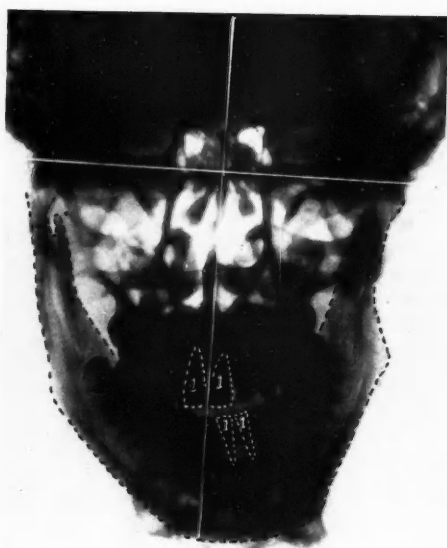


Fig. 7.—It will be noted in this postero-anterior view of the mandible that the apices of the lower incisors are displaced to the left. This side has suffered some damage to the condylar growth centre.

concerned, but only up to a certain age after which accommodation does not occur. My own feeling—though I must say without as careful examination of detail as I should like—is that after the age of 9 years the chances of adaption become very much diminished. At this age it would appear that the dentition has become stabilized. I shall refer to this point later. In skeletal Class III cases we are all familiar with the "late growth spurts". In my series I have had two such cases and both have resulted in cross bites. In other words there have only been minor adaptations of the teeth to facilitate the occlusion; the maxillary alveolus has not responded as earlier in life. It might be argued that the mandibular growth in these cases is directed in the wrong direction and therefore receives no help from the maxilla. This we shall discuss further in a subsequent paragraph.

**4. The Secondary Changes in the Maxilla.**—I have said that in all cases the molar teeth are in some form of occlusion; the arrest in condylar development must therefore imply a corresponding arrest in the maxillary alveolus or maxilla itself.

There is no doubt with regard to the former; of the latter it would appear in the severer cases that there is a difference in the levels of the infra-orbital margins. Dr. Spalding Smith and I have been keen to demonstrate this point in these and other cases. He and I have examined these cases and have come to the conclusion that there is a definite change in the maxilla itself.

It can be seen from Fig. 6 that there appear to be obvious changes in the maxilla. We shall be writing shortly on this subject giving a more detailed account and including many other lesions. Scott (1953) has recently stated that skulls showing abnormal growth illustrate the developmental independence of various regions of the skull. This is indeed very true and whatever the primary abnormality it is equally true to say that the compensation for such a defect can be surprising.

**5. The Secondary Changes in the Chin.**—The bearing of condylar growth upon the formation of the chin is well seen in the bilateral cases of condylar arrest.

The chin of *Homo sapiens* has attracted attention in fields of dentistry, since it is listed as one of his main characteristics. In studying the cases from this angle one rather peculiar observation became apparent. The apices of the anterior mandibular teeth in some of the cases seemed to be literally pushed towards the under-developed side which was lacking in condylar growth, the crowns apparently maintaining their relationship with the upper teeth (Fig. 7). Friel's (1945, 1949) work and interest in the migration of teeth is well known and I am sorry he is not here to join in the discussion. It would seem that this apical movement is something different to Friel's and Brash's work. The apical movement occurs at a later phase and it is dependent in some way upon condylar growth. The greater the forward condylar growth the greater the inclination of the apices. I observed in one case that the crown contact was not necessary—a case with a missing incisor demonstrated the change equally well. I studied some cases of condylar hyperplasia and noted that a similar change was evident.

In the bilateral condylar arrests we have the retroposed apices and in the bilateral Class III the apices are well forward. *There is no doubt that some relationship exists between the condylar growth and apices.* This and other reasons make me believe Scott (1955) is correct in attaching little importance to the "apical base". Salzman (1943) has mentioned the work of Walkoff who thought that the basal bone accounted for the prominence of the chin. Many workers have been insistent upon the fact that there is no appositional bone growth around the chin. If we turn our attention to Cook (1933) reporting the work of Bolk who thought that as opposed to our nearest relatives, there was a slowing down of the process in the change from the deciduous to the permanent dentition. In the apes we had a more even and rapid change, in man there is a delay and particularly with the eruption of the second and third molars. During this period it is thought that the basal bone forms the chin while the occlusion of the teeth remains fairly stationary. Elliott Smith (1932) has also written on this subject and he thought

that the development of the brain might be an explanation. This problem will require further work before dogmatic statements can be made. Before leaving this particular point we ought to bear in mind the work of Symons (1953) and a statement by Sicher (1952) in which he states that the changes in the condylar angle are caused by a change in the direction of proliferation of the condylar cartilage. In the early years the maximum growth is forwards while later the change tends to a more downward growth. This is very important and I am sure will lead to a lot of further work. This means that the direction of growth can be influenced and is in fact in certain cases markedly changed.

**6. Secondary Changes in the Angle of the Mandible.**—Once again I must agree with Rushton (1948) in condemning those who still believe that there is a growth centre at the angle. The growth of bone at the angle is that of appositional bone and nothing more or less. I think Wilson Charles (1934) gives the best explanations of this bone growth when he says that the resultant downward condylar growth as it were pulls the muscle up over the ramus. *This notch in front of the angle is simply caused by the lack of downward growth and the apparent heaping up of the muscle appositional bone.* Its extent is dependent upon the extent of the condylar arrest and the already determined muscle size. In other words a condylar arrest appearing in a well-developed individual will account for a large notch.

**7. Mandibular Contour.**—I think we are all agreed that minor adjustments occur and that there is no extensive resorption of the anterior surface of the ramus.

**Acknowledgements.**—I must express my sincere thanks to Professor T. Pomfret Kilner, Mr. R. P. Osborne, and Mr. J. P. Reidy; without their kind help it would have been impossible to collect this number of cases.

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### Objektive Erfassung der Gingivo-Therapeutischen Wirkung einer Zahnpaste

One hundred and two patients were treated with a dentifrice containing vitamins A and D, and a further 90 used as controls. All had a gingivitis for which no other treatment was given.

Assessment of the value obtained by use of the dentifrice was made by routine clinical diagnosis, the P.M.A. index and comparisons of Kodachromes before and after the period of observation, which lasted two months.

Simple clinical diagnosis showed no change, but the P.M.A. index and the comparison of the Kodachromes showed a significant improvement, which was found to a lesser degree with the placebo dentifrice.—HIRT, V. C., and MUHELMANN, H. R. (1956), *Parodontologie*, **10**, 44.

# CONGENITAL EPULIS (MYOBLASTOMA OR ABRIKOSOFF'S TUMOUR) IN A NEWBORN INFANT

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## CASE REPORT

On April 23, 1954, M. T., a full-term female infant, was born. The infant had a large tumour mass which completely filled the mouth entrance. In all other respects the infant was normal. The mother's medical

and thin-walled blood-vessels. The main bulk of the tumour is made up of relatively large cells with eosinophilic, coarsely granular cytoplasm and a small nucleus (Figs. 2-4).



Fig. 1.—Note the tumour mass protruding beyond the lips and everting them.

history was non-contributory, and M. T. was her third child.

Examination revealed a pedunculated tumour, measuring  $26 \times 20 \times 11$  mm., attached to the surface epithelium in the midline of the mandibular symphysis. The consistency was firm, the slightly crenated surface being covered by normal epithelium. The tumour was positioned between the alveolar margins of the premaxilla and the mandible, the infant being unable to close its mouth, and therefore unable to feed.

Fig. 1 is a "soft" X-ray and shows the tumour mass protruding beyond the lips, causing eversion of the upper and lower lips.

**AT OPERATION.**—At the request of the Consultant Paediatrician in charge I operated at age 18 hours. Under endotracheal anaesthesia the tumour was excised together with the pedicle and surface epithelium. Recovery was smooth and uneventful, normal infant feeding being instituted within a few hours of operation.

The child has been under constant review. She is now a healthy, bonny, and intelligent child.

**HISTOLOGY.**—Section shows a nodule covered by stratified squamous epithelium containing many wide

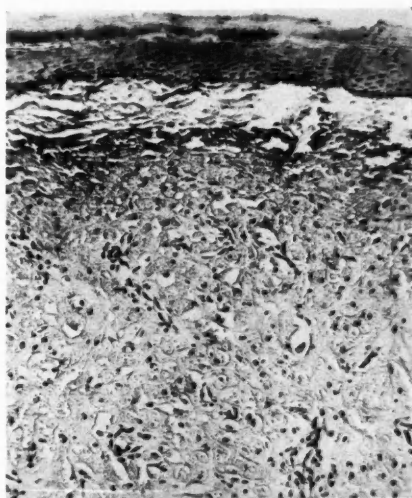


Fig. 2.—Squamous stratified epithelium encloses the tumour. The cells under the epithelium are large, but with small nuclei and coarsely granular cytoplasm. ( $\times 96$ .)

Section of the tumour was sent to the members of the Child Tumour Registry, and "all members of the Child Tumour Registry agree that this tumour is a so-called myoblastoma or an Abrikossoff's tumour that is quite benign" (April 23, 1954.)

## DISCUSSION

Pleasants and Hinds (1955), in a review of 257 cases of granular-cell myoblastoma, state that only 12 occurred in the newborn, and, of these, 9 were in the maxilla and 3 in the mandible. Since this review Hankey (1955) has reported a case in the molar region of the mandible in a ten-weeks' premature infant. Horn and Stout (1943) warn of the possibilities of recurrence if the tumour is incompletely



removed, whilst Crane and Tremblay (1945) state that if metastases form, these tumours should be called "rhabdomyosarcoma". Abrikossoff (1926) considered that these tumours were composed of immature muscle

tumour under discussion and must refer to those tumours which arise post-parturient. The title "congenital epulis" is the most readily acceptable name for the present case.

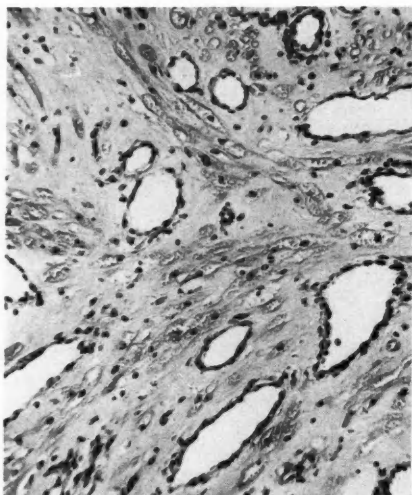


Fig. 3.—Section from a deeper area of the tumour showing a number of thin-walled blood-vessels. ( $\times 96$ .)

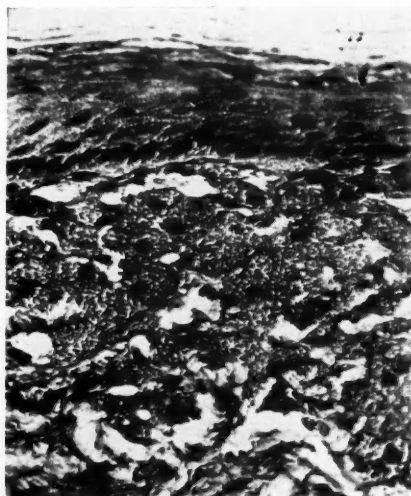


Fig. 4.—Showing intense granularity of the sub-epithelial tumour cells. ( $\times 192$ .)

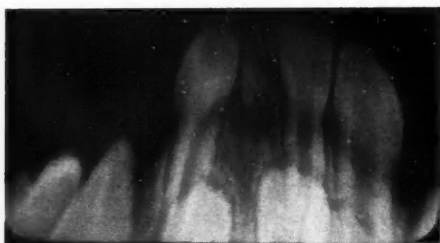


Fig. 5.—Supernumerary-like tooth in region of  $\bar{A}$ . An outline of a lamina dura can be seen demarcating the root socket of  $\bar{A}$ .

elements, and called them "myoblastic myoma". Neumann's (1871) description of these tumours as "congenital epulis" aptly describes the case now reported. Willis (1948) considers these tumours to be benign, but states that "their common sites of occurrence suggests a traumatic origin". This latter statement can hardly be applied to the

When last seen, on Jan. 24, 1956, the erupted lower incisors were B/AB, with appearance of a supernumerary tooth in the region of  $\bar{A}$ . The X-ray (Fig. 5) confirms the absence of a root to the small crown appearing in the region of  $\bar{A}$ , but there is the outline of a lamina dura which outlines a root socket, similar in mesiodistal width to the root socket for  $\bar{A}$ . The dentine papilla of  $\bar{A}$  has failed to develop normally, the outline of the lamina dura suggesting that there has been some attempt at organization of mesoblast, and it is suggested that this mesoblastic element has become aberrated and formed the congenital epulis.

#### SUMMARY

A case of congenital epulis or granular-cell myoblastoma in the mandible of a newborn infant is described.

A possible origin is suggested.

The tumour is benign.

I am indebted to Dr. P. D. Moss, Consultant Pædiatrician in charge, for access to the case; members of the Child Tumour Registry for their reports; Mr. S. G. Heaton, Senior Technician, Manchester Dental Hospital, for the photomicrography; and Dr. Teunon, Consultant Radiologist, for the loan of the X-rays.

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## ABSTRACTS FROM OTHER JOURNALS

### The Dental Status of the Indigenous Peoples of British West Africa

In this paper the author, a student of Sutherland Dental School, reviews the problem of dental disease and its treatment in the negro populations of West Africa. Incidence of caries and periodontal disease are discussed, their apparent inverse relationship being stressed. A summary follows of the aetiology of dental caries, including Egyedi's glycogen theory, and the place of carbohydrate and calcium intake, with particular reference to breast-feeding. Parodontal disease accounts for more lost teeth than caries, sometimes at an early age, indicating that the type of disease prevalent may be an oral manifestation of a systemic deficiency, local factors being merely exciting causes of periodontal breakdown. A number of tables of dietary values of various native foods and an extensive bibliography are provided, with two appendices of statistics analysing dental treatment provided in West Africa and native methods of preparing flour.—GREEN, H. E. B. (1956), *Univ. Durham med. Gaz.*, March.

### Anæsthetic Explosions

A report has recently been published by the Ministry of Health of a working party on anæsthetic explosions under the chairmanship of Professor Gilbert Stead. The main report is divided into two sections dealing with an analysis of past explosions which have been caused by: (a) Equipment producing sparks or heat near anæsthetic apparatus; (b) Static electrification of rubber and clothing. An

apparatus which ionizes the air to dissipate charges is described as a possible solution to the problem, but the only complete solution appears to be the discovery and use of non-explosive gases as substitutes for those at present in use. Section F is concerned with risks in Dental Departments. The extremely explosive nature of trichlorethylene and divinyl ether is stressed. There are two appendices, the first dealing with a safety code for equipment and installations used in conjunction with explosive anæsthetics, and the second a form of warning notice to be exhibited in hospitals.—*Report of a Working Party on Anæsthetic Explosions* (1956). London: H.M. Stationery Office, price 2s. 6d.

### Use of Epoxy Resins in Restorative Materials

A study of a relatively new synthetic resin belonging to a group known as epoxy resins indicates that it may have application as a dental restorative material. These resins will cure at room temperature to produce a strong, chemically stable thermoset solid with outstanding adhesiveness. In this paper, an epoxy resin is used as a binder for fine particles of fused silicon dioxide and porcelain. The following properties are described: thermal expansion equal to that of tooth structure; adhesive properties; colour stability; apparent stability and insolubility in the oral environment. Further clinical investigation of these materials is indicated in view of the encouraging results obtained *in vitro*.—BOWEN, R. L., D.D.S. (1956), *J. dent. Res.*, **35**, 360.

## OCCCLUSION IN SHEEP—SOME BREEDING EXPERIMENTS

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THE number of years a ewe can remain on the hillside bearing an annual crop of lambs is intimately dependent on the length of time its front teeth remain functional. With advancing age, the incisors tend to become loose and fall out, leaving the sheep, in farming parlance, "broken-mouthed" and unable to crop sufficient sustenance from the mountainside to support both itself and a lamb. The age at which ewes lose their teeth considerably influences policy and the early loss of the teeth of his ewes will have marked financial significance to the farmer, for when a breeding ewe on a hillside ceases to have a full complement of incisors it must be sold at a lower price, either for slaughter or to a Lowland farmer, who can supply pasture which can be cropped more readily without incisor teeth.

The breakdown of the supporting tissues of the teeth, resulting ultimately in them falling out, must be regarded as a form of parodontal disease.

**Dental Anatomy of the Sheep.**—Like other pecora, the sheep has a dental formula for its permanent dentition of:—

$$\begin{array}{cccc} \text{I.} & \frac{0}{3} & \text{C.} & \frac{0}{1} & \text{P.M.} & \frac{3}{3} & \text{M.} & \frac{3}{3} \end{array}$$

The lower canine is shaped like the incisors and ranges with them. They bite or "occlude" into or on to a hard maxillary pad of gum. The grass or other herbage is cropped between incisors and the pad and, after being swallowed, is later regurgitated from the rumen to be masticated with the premolars and molars of one side of the mouth at a time. The mandibular joint allows lateral excursions, but not anteroposterior ones. The arches of the posterior teeth are so arranged that when these teeth on one side of the mouth are functioning, those of the other and the anterior teeth are completely out of action. So also, when the incisors occlude against the maxillary pad, the posterior teeth cannot come into

contact. The sheep has, therefore, virtually three functional occlusions—an incisive and a right and a left posterior masticatory occlusion.

Such a complex of occlusions is common amongst ruminants and must be regarded as a protective mechanism to prevent excessive strain over long periods on the supporting tissues of the teeth. To live successfully on a diet of grass entails the consumption of large quantities, and the waking hours of pecora are largely occupied in either cropping or ruminating. If during this time all the teeth were functional, the stress and strain on the supporting tissues would increase parodontal damage and reduce the life of the teeth. Furthermore, the incisor teeth in pecora are not firmly fixed in their sockets. There is a normal mobility, partly due to a deficiency in the labial bone of their sockets, which is probably protective in character. The maxillary pad of gum is rounded in form and it is evident that the direction of the stresses that are brought to bear upon the incisor teeth is dependent upon the part of the pad on which they impinge. Furthermore, these stresses are considerable in view of the fact that the molar and premolar teeth are non-functional whilst the herbage is being cropped.

The manner in which the incisor teeth occlude on the maxillary pad has received comparatively little attention in the literature. Tomes, Tims, and Henry (1923) in their textbook wrote: "The lower incisors are antagonized not by teeth, but by a dense gum which clothes the forepart of the upper jaw." Box (1935), however, pointed out that in "some sheep the lower incisors and canines strike the pad only on the lingual plane of the crown, producing through wear teeth that are chisel-shaped", and goes on to say that "in others the pressure is mostly axial, the tops of the crowns presenting flat surfaces". Nordby, Terrill, Hazel, and Støghr (1945)



recognized different occlusions of the incisors against the maxillary pads in the Rambouillet flocks of the Western Sheep Breeding

a large Rambouillet flock, whereas when one or both parents were overshot, 16.4 per cent of the offspring were abnormal in this respect.



Fig. 1.—Sow-mouth in a Black-faced lamb.

Laboratory and the United States Sheep Experimental Station, Idaho, which they described as follows:—

Normal—front teeth and dental pad approximately meet.

Slightly overshot—lower jaw slightly shorter than upper.

Overshot—lower jaw 0.2–0.5 cm. shorter than the upper.

Badly overshot—lower jaw more than 0.5 cm. shorter than the upper.

Undershot—in which the incisors extend beyond the dental pad.

“Badly overshot” is an abnormality well recognized by shepherds in Britain, being termed “rat-mouthed”, “sow-mouthed”, or “parrot-mouthed”, depending on the district (Fig. 1).

This hereditary abnormality is a recessive and Kelley (1942), as a result of his experiments with breeding in Merino sheep, advocated the examination by sire  $\times$  daughter matings of sires, to determine whether they should be used extensively.

Nordby and others (1945) found that marked inequality of the upper and lower jaws occurred in 1.4 per cent of the lambs in



Fig. 2.—Type 1 occlusion in a Suffolk tup.



Fig. 3.—Right-angled wear of attrition in Suffolk tup with Type 1 occlusion.

For breeding purposes they considered “slightly overshot” as being normal, for Nordby (1935) held the view that whilst the pronounced abnormalities were definitely inherited, judgement must be reserved regarding the inheritance of the minor differences.

Hitchin (1948) described three types of occlusion in sheep which he regarded as within the range of normal, and in each type characteristic kinds of attrition were produced.

Furthermore, the incidence of the types of occlusion in different breeds appeared to vary.



Fig. 4.—Type 2 occlusion in Cheviot ewe.



Fig. 6.—Type 3 occlusion in Border-Leicester ewe.

The types of occlusions described are as follows:—

Type 1: The incisors bite into the maxillary pad so that the stress is more or less axial in

character and they become worn, producing a surface at right angles to their long axes. (Figs. 2, 3.)

Type 2: The incisors occlude on to the front of the pad of gum so that stress is more or less oblique and produce through wear a sharp chisel-like bevel facing posteriorly. (Figs. 4, 5.)

Type 3: The incisors stand completely in front of the maxillary pad, which impinges on

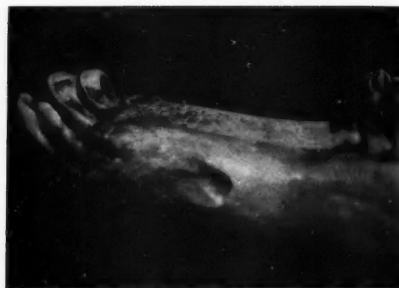


Fig. 5.—Sharp chisel wear of attrition in Cheviot ewe with Type 2 occlusion.

the gum behind them. By this means, rather long grass is gripped and with a movement of the head is snapped over the incisors, so that they become worn with a ragged bevel facing anteriorly. (Fig. 6.)

This Type 3 occlusion is found especially in the Border Leicester breed, and in a random sample of 25 sheep of varying ages from a pedigree Border Leicester flock it was found that 25 had Type 3 occlusion. This appears to have been produced in an attempt by breed selection to secure a short maxilla and a prominent mandible, which is characteristic of the breed.

## INVESTIGATION

In 1947 an invitation was received to investigate a problem which was worrying farmers with Cheviot sheep in Nithsdale, Dumfries-shire. It is usual to draft a ewe from a Cheviot hill flock at 5 or 6 years of age, but about ten years before in the affected flocks a much larger proportion than formerly had lost incisor teeth. Usually in the past, 1 per cent of the cast ewes had lost front teeth,

but in 1943 as many as 50 per cent of the cast ewes had "broken-mouths" and loss of teeth following progressive loosening was occurring much earlier and sometimes at as young an age as 3 years.

The dentition of 57 of these Cheviot ewes between the ages of 3 and 6 years were examined in June, 1947, and it was noticed that in the majority there was an inflammatory condition of the gingival margins, and in many there was increased mobility of the incisor teeth.

There were also in the adjoining parishes flocks of the Black-faced breed living in an apparently similar environment and it was reported that these were unaffected. No trouble from early loss of teeth had been noticed amongst them. A comparison of the occlusion in the two breeds in the vicinity revealed that most of the Black-faced breed had Type 1 occlusion, whereas most ewes of the Cheviot breed displayed Type 2 occlusion. Since 1947 it has been possible to examine a few random samples of lambs and ewes in the district and the results are shown in Table I.

It is evident from these figures that, at least in the flocks examined, Type 1 occlusion

in the Cheviot breed. It is interesting to observe that in both breeds the incidence of Type 1 occlusion is greater in lambs than in adult ewes and that there is a tendency,



Fig. 7.—Cheviot lamb with Type 1 occlusion produced in breeding experiment. Sire Type 1 occlusion and dam Type 2 occlusion.

though this varies in degree in the two breeds, for the teeth to move forward in relationship to the pad as the age advances. There is the possibility that suckling may be a factor in

Table I.—BREED VARIATIONS OF OCCLUSION IN SHEEP IN NITHSDALE

	TOTAL SAMPLE	TYPE 1	TYPE 2	PERCENTAGE TYPE 1
Random Cheviot lambs (deciduous teeth)	44	21	23	47.7
Random Cheviot ewes 1947	39	2	37	
1948	44	5	39	
1949	44	5	39	
1951	24	3	21	
	151	15	136	9.9
Random Black-faced lambs (deciduous teeth) 1951	87	82	5	94.2
Random Black-faced ewes 1947	12	12	0	
1951	24	21	3	
1952	49	41	8	
	85	74	11	87.1

is so common in the Black-faced breed that it may be regarded as normal for the breed; whereas Type 2 occlusion is almost as common

the production of the greater incidence of Type 1 occlusion in the deciduous dentitions in lambs.

The kind of incisive edge produced by the wear of attrition is of significance, not only because it is dependent on the occlusion, but also that one can detect those sheep which had Type 1 occlusion originally and whose incisors had splayed forward owing to parodontal disease, thus simulating Type 2. The latter, however, were not of common occurrence.

It has been shown by Box (1935) that if an artificial crown is fitted to an incisor tooth in

therefore made for Cheviot tups with Type 1 occlusion to serve Cheviot ewes with Type 2 occlusion. This was done and the lambs produced were examined the following year, the results being shown in *Table II*, and a typical Type 1 occlusion in one of the lambs is illustrated in *Fig. 7*.

The figure of 71.5 per cent of Type 1 occlusion in these lambs must be compared with 47.7 per cent Type 1 occlusion as shown in

*Table II.*—LAMBS OBTAINED BY TYPE 1 TUPS OUT OF TYPE 2 EWES (OVER 90 PER CENT)

SIRE (TYPE 1)	TOTAL LAMBS	NUMBER OF TYPE 1	NUMBER OF TYPE 2	PERCENTAGE TYPE 1
"Myredykes" 1948	46	35	11	76.1
"Myredykes" 1949	50	30	20	60
"Jet Propelled" 1948	29	20	9	69
"Jet Propelled" 1949	21	19	2	90.5
Two unnamed Type 1 tups	100	73	27	73
	246	177	69	71.5

a sheep with Type 1 occlusion to convert the stress from an axial to an oblique direction without affecting the function of neighbouring teeth, the degree of mobility of the tooth and the depth of its gingival crevice increase.

That parodontal disease is only common in the Cheviot breed in this area is therefore partly explained by the type of occlusion commonly found in the breed and Type 2 occlusion must be regarded as a predisposing cause of parodontal disease in sheep. Furthermore, it does not occur to any extent amongst sheep on Lowland farms with a less traumatogenic diet, but this may not be the only difference, for the environment of hill farms always entails a much more severe struggle for existence, particularly during severe winters, following which there is some evidence that parodontal disease is more common. It may be that in the Rambouillet flocks of Nordby and others (1945), the difference between the normal and slightly overshot is of no practical significance, because they were not hill sheep.

### BREEDING EXPERIMENTS

These observations suggest that occlusion should be one of the factors taken into account in breed selection in hill sheep. A search was

*Table I* when Type 2 tups were used, and the difference is evidence in support of the assertion that in the selection of sires in hill sheep the type of occlusion is a point of importance.

Attention has since been drawn to a Black-faced flock in Lanarkshire in which parodontal

*Table III.*—OCCLUSION IN TUPS IN BLACK-FACED FLOCK IN LANARKSHIRE

	TYPE 1	TYPE 2	PERCENTAGE TYPE 1
2-shear	2	2	
3-shear	1	1	
4-shear	0	2	
5-shear	0	1	
	3	6	33.3

disease had been causing early loss of teeth. The farmer had found that whereas in 1921 5 per cent of his cast 5-year-old ewes had "broken-mouths", in 1950 of 97 cast 5-year-old ewes 38 had "broken-mouths". A random sample of ewes from this flock revealed the following:—

Total	Type 1	Type 2	Percentage Type 1
43	16	27	37.2

This was a very different figure from the 87 per cent of Type 1 occlusion in Black-faced ewes in Nithsdale, and the tups being used in this Lanarkshire flock were therefore examined. The results are shown in Table III.

Only one-third of these rams were of Type 1, which would explain the low incidence of Type 1 occlusion in their progeny.

### SUMMARY

Types of occlusion of the incisors in sheep are described. If stress upon the teeth is oblique in character, there is a greater liability to parodontal disease.

The type of occlusion is dependent, *inter alia*, on genetic factors, and sires with Type 1 occlusion should be chosen in hill flocks.

**Acknowledgement.**—I wish to acknowledge my indebtedness to the West of Scotland College of Agriculture, Auchincruive, Ayrshire, and to the late Dr. George Dunlop in particular, for drawing my attention to this problem and for giving me the opportunity to investigate it and for assisting me in the investigation.

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## BOOK REVIEWS

**PHARMACOLOGY AND ORAL THERAPEUTICS.** A Textbook for Students and Practitioners. By EDWARD C. DOBBS, B.S., D.D.S., F.A.C.D., Professor of Pharmacology and Therapeutics, Dental School, University of Maryland. Eleventh edition.  $8\frac{1}{2} \times 5\frac{1}{2}$  in. Pp. 579, with 27 illustrations. 1956. London: Henry Kimpton. 67s. 6d.

THE previous edition of this book was called *Pharmacology and Dental Therapeutics*, and the change indicates that the scope is now wider. Allocation of the available space according to the needs of the two groups mentioned in the sub-title cannot have been easy, but Professor Dobbs evidently believes that extensive grounding in general principles must precede their application and has given 470 pages to Part 1 (Pharmacology) and 90 to Part 2 (Therapeutics). Some of the discussions of drugs and their actions given in Part 1 appear to be rather superficial for student needs, however; and devotion to Part 2 of the space saved by sacrificing these might have increased the value of the latter to practitioners. United States nomenclature is of course used throughout; but it is unfortunate that proprietary rather than approved names are sometimes preferred as paragraph headings, with no clear indication that this is the case.

Detailed references to review articles and original work in the sections dealing with general principles are rather sparing; but these are admirably frequent in sections on drugs of specific dental importance.

C. R. B. J.

**A MANUAL OF ORAL SURGERY.** A Step-by-step Atlas of Operative Techniques. By W. HARRY ARCHER, B.S., M.A., D.D.S., Professor of Oral Surgery and Anæsthesia, School of Dentistry, University of Pittsburgh.  $10 \times 7$  in. Pp. 877 + xvi, with 1400 illustrations. 1956. Philadelphia and London: W. B. Saunders Co. £5 15s. 6d.

THE publication of a second edition of this important work only four years after the publication of the first, which was reprinted on two occasions, is sufficient tribute to its value and an indication of its popularity in the profession. Moreover, further illustrations and material have been added to make this edition more comprehensive.

Professor Archer and his collaborators have produced a book which is authoritative and whilst too advanced for the undergraduate dental student, it is of special value to the postgraduate in oral surgery and later should remain on his shelves for frequent reference

when he becomes more experienced. Oral surgical techniques are described and illustrated in considerable detail and the full case histories following the consideration of a subject are of special value.

It is true that British readers, unacquainted with the forceps techniques common in the United States of America, will find in the first chapter much that is not in accord with their own practice; but the basic principles remain the same and are clearly expounded.

So also the methods of handling of injuries of the jaws are often different in technique to those used in this country; but in a chapter by Col. Wm. B. Irby the British methods of cast splint construction are described and their advantages acknowledged. This is a welcome sign in a book from the U.S.A., where European contributors are usually ignored, and is evidence of a breadth of approach to the subject, which is to be commended.

This excellent work should be not only in every dental library; but also available for reference by all who aspire to the practice of oral surgery. It can be heartily recommended.

A. D. H.

**PERIODONTAL THERAPY.** By HENRY M. GOLDMANN, D.M.D., F.A.C.D., Director of the Riesman Dental Clinic, Beth Israel Hospital, Boston, etc.; SAUL SCHLUGER, D.D.S., Associate Clinical Professor of Dentistry, Faculty of Medicine, School of Dental and Oral Surgery, Columbia University; and LEWIS FOX, D.D.S., F.A.C.D., Associate Professor of Periodontology, Graduate School of Medicine University of Pennsylvania, etc. 10 × 7 in. Pp. 565, with 190 text illustrations and 100 plates. 1956. London: Henry Kimpton. £7.

THIS is the first book which has ever been devoted exclusively to periodontal therapy and should be given a warm welcome. Throughout it describes in detail treatment methods practised by the authors with success, but to obtain maximum value from this work it is essential for the reader to have already some considerable knowledge of periodontal

pathology, otherwise he will be in grave danger of performing empirical treatment.

Sections are devoted to all the recognized forms of treatment and of great value is a chapter in which consideration is given to such special problems as over-lapping teeth, bifurcation, and trifurcation involvement, long proximal contacts, and many others. Of the twenty-three chapters, only one proved to be a disappointment to the reviewer. This dealt with occlusal adjustment and failed to produce that degree of clarity which enables a student to grasp the essence of what initially appears to be a most complicated problem.

The volume is profusely illustrated by high-quality photographs and drawings which demonstrate operations stage by stage. A certain number of the illustrations tend to be repetitive and deletion of a few would in no way detract from the value of the book, whilst it might enable a slight reduction in the price.

Nomenclature used is that which is widely accepted by most English speaking periodontologists, though "pericementitis" has crept in on two occasions. The authors, as might be expected, reveal a mature and well-balanced approach to periodontal treatment based on a sound knowledge of the pathology of the lesions to be treated and go to considerable pains to emphasize the importance of gingival form. A statement that healing after use of the electronic scalpel is distinctly slower than after the use of any other method does, however, fail to conform to the experience of many authorities.

The standard of publication is high, there being few typographical errors and both paper and binding are of excellent quality.

All in all, this is a book which can be recommended to any one who has already a basic knowledge of periodontology, although for British undergraduate students and some general practitioners it is too advanced. Certainly no periodontologist should be without it and a copy should be on the shelves of every medical and dental library.

A. B. W.